Annals of Medicine and Medical Sciences (AMMS)
Volume 04, 2025, *Page No.: 173 to 178*
Available at: *http://ammspub.com*

Original Article

OPEN ACCESS

Evaluation of Sleep Pattern in Children with Epilepsy: A Cross-Sectional Study

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Abstract

Objective: Sleep disorders are a common concern in Paediatric patients with epilepsy. The aim of this study was to evaluate sleep pattern in children in age group 1-18 years with epilepsy. Secondary objective was to study association of sleep problem with various anti-epileptic drugs. ***Methodology:*** It was a Cross-sectional study, conducted in a tertiary care hospital in Central India from September 2023 to September 2024. Children diagnosed with epilepsy from 1 to 18 years of age & in a steady state were included & those with cerebral palsy, syndromic epilepsy, pre-existing sleep disorders were excluded. The present study examined parent reported sleep patterns using the Children's Sleep Habits Questionnaire. A total of 51 patients, aged 1 to 18 years & diagnosed with epilepsy were enrolled. Seizure-related data, including frequency, type and antiepileptic drug regimens, were obtained from medical records. Statistical analysis was conducted to investigate the association of sleep disturbances and epilepsy-related factors & Antiepileptic drugs. ***Results:*** There were total 51 children in the study, 26 were male (50.98%) & 25 were female (49.02%). Nearly half of the children (49%) had a consistent bedtime routine and sleep onset, with 35% falling asleep within 20 minutes. A significant portion children (65%) sleep in their own beds, but 20% need a parent present. Sleep disruptions were evident, with 10% snoring loudly every night and 30% waking up at least once during the night. 68.63% of patients were treated with monotherapy, while 31.37% required polytherapy for seizure control. There was no association of sleep problem with various anti-epileptic drugs like Carbamazepine, Sodium valproate & Levetiracetam & monotherapy vs polytherapy. ***Conclusions:*** The present study demonstrates that a considerable proportion of children with epilepsy experience significant sleep disturbances, characterized by prolonged sleep latency, frequent nocturnal awakenings and excessive daytime sleepiness.

Keywords: ***Sleep disturbances, Epilepsy, CSHQ, Antiepileptic drugs.***

Introduction

Sleep disorders are common in the Paediatric population, especially among children with neurological conditions like epilepsy [1].

Epilepsy is a neurological disorder affecting approximately 1% of children. Approximately 25%-50% children with epilepsy have prominent behavioural features with sleep problems [2,3]. As many as 80% of children with epilepsy manifest these difficulties [4-8] regardless of whether they are measured via parental report [9] or polysomnography [10].

In India, 24.6% of individuals with epilepsy experience sleep disturbances, which can worsen seizure activity and contribute to chronic illness [11,12].

Children with epilepsy often experience comorbidities, including sleep disturbances, which can significantly affect their quality of life, cognitive function, and overall development. Sleep is crucial for physical health, emotional regulation, and cognitive development in children. While sleep disturbances in epilepsy have been acknowledged, most studies primarily focus on adults or generalized epileptic syndromes [11,12].

There is limited data specifically analysing the sleep patterns in children across different types of epilepsy and how various antiepileptic therapies influence sleep architecture.

Therefore, the present study was conducted to evaluate sleep patterns and the prevalence of sleep disturbances in children with epilepsy.

Aim & Objectives

Aim: To evaluate sleep pattern in children with epilepsy between 1-18 years of age.

Secondary objective: To study association of sleep problem with various anti-epileptic drugs.

Methodology

This Cross-sectional study was conducted in a Tertiary care hospital from September 2023 to September 2024(1 year). Children diagnosed with epilepsy in age group of1 to 18 years of age were included in the study. Those children diagnosed with cerebral palsy,

Received: February 19, 2025; **Revised:** March 29, 2025; **Accepted:** April 05, 2025

syndromic epilepsy or with pre-existing sleep disorders were excluded.

A total of 51 patients, aged 1 to 18 years & diagnosed with epilepsy were enrolled. Sleep patterns were evaluated using the Children's Sleep Habits Questionnaire (CSHQ). Parents are asked to recall sleep behaviours occurring over a "typical" recent week. Items are rated on a three-point scale: "usually" if the sleep behaviour occurred five to seven times/week; "sometimes" for two to four times/week; and "rarely" for zero to one time/week. Seizure-related data, including frequency, type and antiepileptic drug regimens, were obtained from medical records. Statistical analysis was conducted to investigate the association of sleep disturbances and epilepsy-related factors & Antiepileptic drugs.

The Children's Sleep Habits Questionnaire was used to interview Parents to recall sleep behaviours occurring over a recent "typical" week. Child sleep habits were measured using Children' Sleep Habits Questionnaire (CSHQ) scores [2,13]. The CSHQ is an approved instrument for both behaviourally and medically based Paediatric sleep difficulty. The CSHQ is a 33-item-based psychometric assessment for eight domains: bedtime resistance, sleep-onset delay, sleep duration, sleep anxiety, night awakenings, parasomnias, disordered breathing, and daytime sleepiness. A total score can be ranged from 33 to 99 based on calculation from all of the above-mentioned domains [2].

Statistical analysis

The data was entered into Microsoft Excel and presented in both tables and graphs. Frequency and percentage were used to describe qualitative variables, and the normality of the variable distribution was assessed. Fischer Exact test was done to study association of sleep disorders and monotherapy/polytherapy of antiepileptic drugs.

The study was carried out after approval from Institutional Ethics Committee and consent from parents

Results

There were total 51 children in the study, 26 were male (50.98%) & 25 were female (49.02%).

According to the Figure 1, nearly half of the children in the study (49%) have a consistent bedtime routine and sleep onset, with 35% falling asleep within 20 minutes. A significant portion (65%) sleep in their own beds, but 20% need a parent present. Sleep disruptions were evident, with 10% snoring loudly every night and 30% waking up at least once during the night.

Bedtime Routine and Sleep Onset

Bedtime Consistency: The majority of children (49%) consistently go to bed at the same time every night, while 24% usually maintain a regular bedtime. Only a small portion of the group (8%) rarely or never follow a consistent bedtime routine.

Sleep Onset: About 35% of the children fall asleep within 20 minutes of going to bed every night, and 39% usually do. However, some children (16%) experience occasional delays in falling asleep, indicating minor sleep onset difficulties.

Sleeping Independently: A significant portion (65%) of the children always fall asleep in their own bed, while another 20% usually do. However, 16% fall asleep with a parent or sibling at least sometimes, suggesting a degree of sleep dependence.

Night time Behaviours

Parental Dependency and Special Objects: Around 20% of the children always need a parent in the room to fall asleep, with another 24% usually needing one. A similar trend is seen in the need for special objects (like a doll or blanket), which some children require to fall asleep. This indicates a reliance on external comfort factors for sleep.

Restlessness and Movement: Approximately 29% of the children are always or usually restless during sleep, moving frequently, while 8% are rarely or never restless.

Bed Switching: Some children (24%) frequently move to another bed during the night (parent or sibling's), while a large portion (39%) sometimes switch beds. Only 6% never move to another bed during the night.

Sleep Disruptions

- **Snoring and Night Terrors:** 10% of children snore loudly every night, with 39% experiencing it occasionally. A small percentage of children (14%) experience frequent awakenings associated with sweating or screaming, with 39% reporting this issue sometimes.
- **Night Waking:** About 30% of children wake up at least once during the night, while 16% wake up more than once. This shows that night waking is a common issue for many children.

Daytime Sleepiness and Naps

- **Napping Habits:** Nearly 39% of children take naps during the day, with another 29% doing so usually. A small portion (6%) rarely or never naps.
- **Daytime Fatigue:** Around 20% of the children are frequently tired during the day, while 29% feel tired usually. Meanwhile, 39% sometimes experience daytime fatigue, indicating a potential link between sleep quality and daytime energy levels.
- **Early Wake-Ups:** About 16% of children consistently wake up earlier than needed, and another 16% usually wake up early. For others, early rising is more sporadic or uncommon.

Morning Wake-Up Patterns

- **Independent Wake-Up:** Most children (49%) wake up by themselves every morning, with 24% doing so usually. Only a few (8%) rarely or never wake up without external assistance.

Sleeping patterns

- **Falls asleep with rocking movements:** Seen sometimes in 35.3% of children, rarely in 23.5%, and never in 11.8%. Always or usually occurs in 15.7% and 13.7%, respectively.
- **Needs a special object to fall asleep:** Required always or usually by 19.6% each, sometimes by 29.4%, and rarely or never by 19.6% and 11.8%, respectively.
- **Resists going to bed:** Happens always in 15.7%, usually in 19.6%, and sometimes in 31.4%. Rarely in 23.5% and never in 9.8%.
- **Afraid of the dark:** Always in 39.2%, usually in 25.5%, sometimes in 19.6%, rarely in 9.8%, and never in 5.9%.
- **Sleeps the same amount daily:** Sometimes in 33.3%, always or usually in 17.6% each, rarely in 21.6%, and never in 15.7%.

- **Grinds teeth during sleep:** Occurs sometimes in 39.2%, always in 13.7%, usually in 15.7%, and rarely in 19.6%. Never in 11.8%. Falls asleep during activities: Always for 19.6%, usually for 27.5%, sometimes for 23.5%, rarely for 21.6%, and never for 7.8%.

Table 1. shows that 68.63% of patients were treated with monotherapy, while 31.37% require polytherapy for seizure control. Monotherapy was more common, simplifying treatment with fewer side effects.

Table 2 shows that 68.63% of patients were treated with one AED, while 27.45% were treated with two AEDs, and only 3.92% require three AEDs. This distribution highlights that, most patients were managed effectively with a single medication, suggesting a trend towards simpler treatment regimens.

Table 3,4,5 show that there was no association of sleep problem with various anti-epileptic drugs like Carbamazepine, Sodium valproate & Levetiracetam & monotherapy vs polytherapy. p-value is not significant

Table 1: No. of Anti-epileptic drugs received by patient

Antiepileptic drugs	No. of cases	Percentage
Monotherapy	35	68.63%
Polytherapy	16	31.37%
Total	51	100%

Table 2: Numbers of cases were treated with AED

AED	No. of cases	Percentage
1	35	68.63%
2	14	27.45%
3	2	3.92%
Total	51	100.00%

Table 3: Association of Carbamazepine alone & polytherapy with sleep domains affected

Name of AED	No. of Sleep domain affected	
	2	**>2**
Carbamazepine		
Monotherapy	7	4
Polytherapy	2	3
		p-value = 0.78

Table 4: Association of Sodium Valproate alone & polytherapy with sleep domains affected

Name of AED	No. of Sleep domain affected	
	2	**>2**
Sodium Valproate		
Monotherapy	8	6
Polytherapy	6	3
		p-value= 0.99

Table 5: Association of Leviteracetam alone & polytherapy with sleep domains affected

Name of AED	No. of Sleep domain affected	
	2	**>2**
Leviteracetam		
Monotherapy	12	8
Polytherapy	1	1
		P value= 0.99

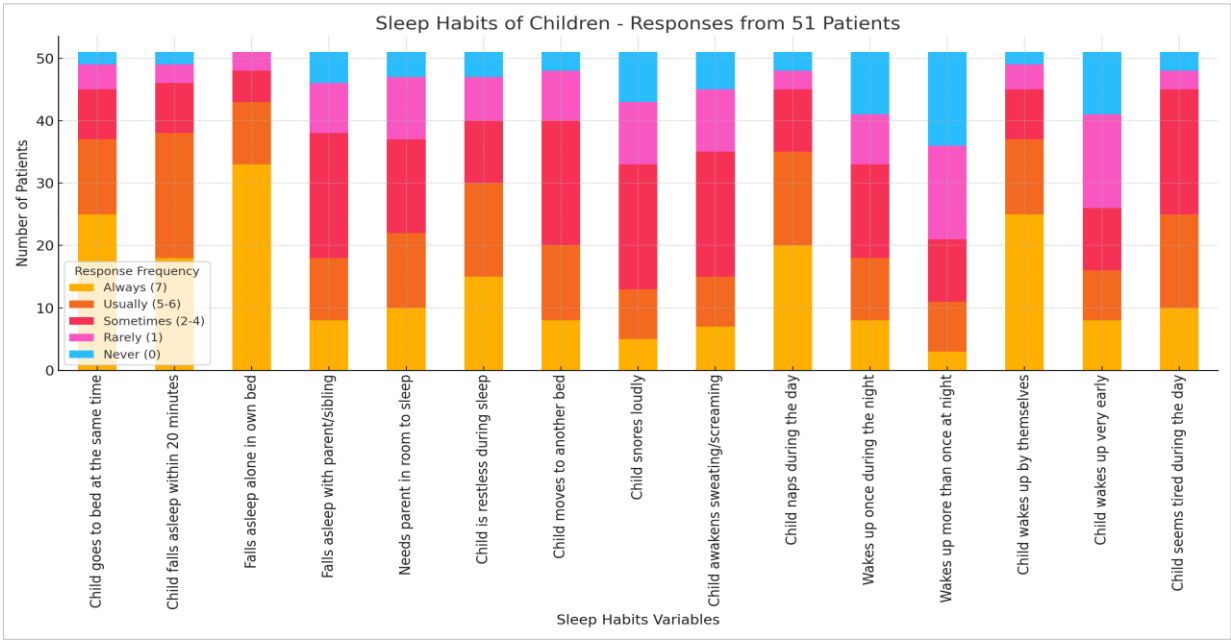

Figure 1: Sleep habits of children

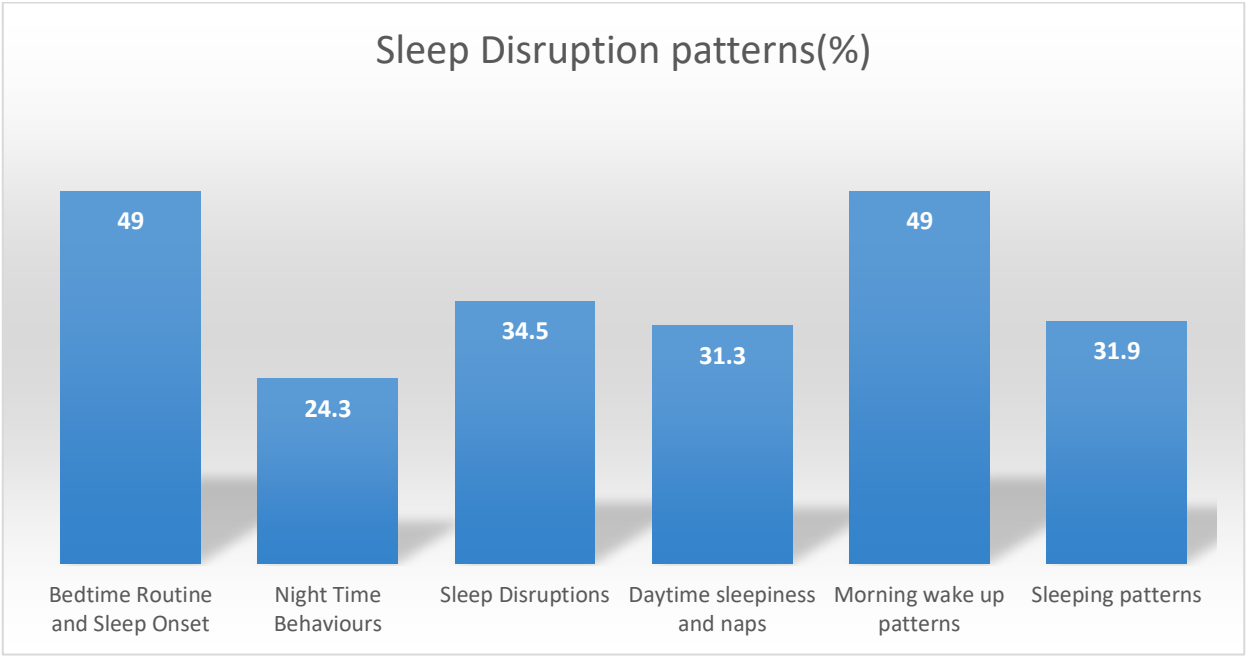

Figure 2: Bar diagram showing average sleep pattern changes in children with epilepsy

Discussion

The present study had children 51 children with epilepsy between the age group of 1 to 18 years. In our study 20% of the children always need a parent in the room to fall asleep, with another 24% usually needing one. In the study by Larson et al. parent–child room sharing and co-sleeping in the night were shown to be more common in children with epilepsy than normal controls [14].

Day time sleepiness was present in 39% of children, 20% were frequently tired during the day while 29% felt tired usually. 30 % of children wake up at least once during night while 16% wake up more than once. 29% were usually restless during sleep. In study by Bashir & Bashir, they found that waking up in the middle of the night (night awakenings), sleep duration, daytime sleepiness, sleep-onset delay, and bedtime resistance were the most common problems among Paediatric population with epilepsy according to CSHQ [15]. In study by Joseph HB et al daytime sleepiness, parasomnias, and bedtime resistance were found to be the major sleep problems of children with epilepsy in the study with mean scores of 15.10 ± 3.76, 9.70 ± 2.30, 8.24 ± 1.77, respectively [16].

Our study showed that children with epilepsy often experience altered sleep architecture, characterized by reduced sleep efficiency and changes in sleep stages.

The findings of this study supported by existing literature that, highlights the prevalence of sleep disorders, such as insomnia, sleep apnea, and parasomnias, among pediatric epilepsy patients [14-18]. These disturbances may arise due to several factors, including the effects of antiepileptic drugs (AEDs), the stress of living with a chronic condition, and the neurological impact of seizures on sleep[12,19].

In the present study, 68.63% of children were taking one anti-epileptic drug. In par with this, other studies showed that most of the children were receiving monotherapy [20,21,22]. In our study there was no relation of anti-epilepsy drugs monotherapy or polytherapy and sleep disorders. In a study from Brazil, refractory epilepsy and polytherapy were found to be related with sleep

problems [5]. Sleep and daytime alertness in children with epilepsy are additionally influenced by antiepileptic drugs, which are the primary treatment for epilepsy to reduce seizure activities [14,23].

Conclusions

The present study demonstrates that, a considerable proportion of children with epilepsy experience significant sleep disturbances, characterized by prolonged sleep latency, frequent nocturnal awakenings and excessive daytime sleepiness. Therefore, appropriate management and understanding the relationship between epilepsy and sleep patterns is crucial for clinicians to enhance both seizure control and the overall quality of life in these patients.

Limitations of the Study

The present study has several limitations. First, the study was conducted in a single tertiary care center, and the results may not be generalizable to other populations or regions. Second, the cross-sectional nature of the study limits our ability to establish causal relationships between epilepsy and sleep disturbances. Third, the reliance on parental reports for sleep patterns may introduce a bias, as parents' perceptions of their child's sleep may not always align with objective measurements like polysomnography. Additionally, the study did not account for factors such as socioeconomic status or other environmental influences that could affect sleep patterns.

Declarations

Acknowledgements

We would like to express our sincere gratitude to all the participants and their families for their cooperation in this study. We also thank the pediatric department and all the staff at the tertiary care hospital for their support throughout the study. Our heartfelt thanks go to the medical records department for providing the necessary information regarding the patients' seizures and anti-epileptic drug regimens.

We are grateful to Dr. Himanshu Dua, Dr. Kiran Gaikwad, Dr. Mrunali Govind Kalamkar, and Dr. Samiksha Andhare for their invaluable guidance, expertise, and support in shaping this research. Their contributions have been instrumental in the success of this project.

Conflict of interest

NIL

Funding/ financial support

None

Author Contributors

Dr. Himanshu Dua played a critical role in conceptualizing the study design, reviewing the methodology, and overseeing the data collection process. His expert guidance was instrumental in analyzing the results and providing clinical insights into the relationship between epilepsy and sleep disturbances in children. Additionally, he was involved in drafting and revising the manuscript and providing substantial intellectual input throughout the study. Dr. Kiran Gaikwad as the corresponding author, Dr. Gaikwad coordinated the research efforts, liaised with the ethics committee for approval, and ensured the study was executed in accordance with ethical guidelines. She was also responsible for statistical analysis, data interpretation, and manuscript writing. Her commitment to ensuring a thorough review of the literature and maintaining accuracy in the research contributed significantly to the success of the study. Dr. Mrunali Govind Kalamkar was actively involved in patient recruitment, data collection, and administering the Children's Sleep Habits Questionnaire (CSHQ). Her involvement in reviewing medical records, collecting seizure-related data, and interpreting the results related to sleep disturbances in children with epilepsy was crucial in understanding the prevalence of sleep issues in this patient population, and Dr. Samiksha Andhare played a vital role in assisting with the administration of questionnaires, gathering data, and providing logistical support for the study. She contributed to the compilation of the results and actively participated in drafting sections of the manuscript. Her work in maintaining patient confidentiality and ensuring the ethical integrity of the study was invaluable.

Ethical Clearance

This study was carried out in accordance with the ethical guidelines set by the Institutional Ethics Committee (NKPSIMS & Lata Mangeshkar Hospital & Research Centre, Nagpur). Informed consent was obtained from the parents or guardians of all participants prior to enrollment in the study. Ethical approval was granted by the Institutional Ethics Committee of the tertiary care hospital, ensuring that all procedures were conducted in an ethical manner while safeguarding the rights and well-being of the participants.

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